

PATENT ABSTRACTS OF JAPAN

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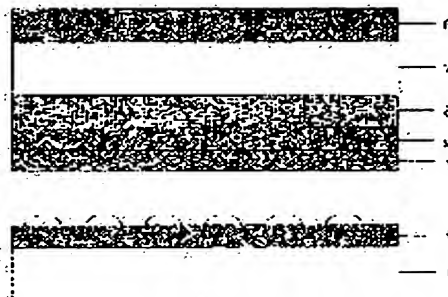
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(54) TRANSPARENT CONDUCTIVE LAMINATED PRODUCT AND TRANSPARENT TOUCH PANEL USING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a transparent touch panel which, while suppressing interference patterns generated between the movable electrode board and the fixed electrode board, alleviates flickering on a high-definition screen, and to provide a transparent conductive laminated product giving the above transparent touch panel.

SOLUTION: The transparent conductive laminated product is the one wherein at least one surface of a transparent polymer substrate 7 is laminated with cured resin layers 8, 9 having unevenness and a transparent conductive layer 10 successively, wherein the cured resin layer 8 consists of a cured resin component and ultrafine particles A having an average primary particle size of ≤ 100 nm and consisting of a metal oxide and/or a metal fluoride, and wherein the ultrafine particles A mainly form aggregates smaller than 1.0 μm .



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CLAIMS

[Claim(s)]

[Claim 1]

The laminating of the hardening resin layer -1 and transparence electric conduction membrane layer which have irregularity is carried out to at least one side of a transparence macromolecule substrate one by one. The hardening resin layer -1 consists of an ultrafine particle A which a hardening resin component and the first [an average of] particle diameter become from a metallic oxide and/or a metal fluoride 100nm or less. (1) As opposed to the hardening resin component 100 weight section an ultrafine particle A More than 5 weight sections Contain at a rate below 50 weight sections, and the ultrafine particle A forms less than 1.0-micrometer floc. (2) The thickness of the hardening resin layer -1 concerned is 1 micrometers or more 10 micrometers or less. (3) JIS of the hardening resin layer -1 The ten-point average of roughness height (Rz) defined by B0601 (1994 edition conformity) 100nm or more less than 500nm and average arithmetic granularity (Ra) are 10nm or more less than 50nm. Furthermore, (4) JIS when carrying out the laminating of the hardening resin layer -1 which has irregularity on a transparence macromolecule substrate Transparent conductive layered product to which the haze defined by B7381 is characterized by being less than 5% 1% or more.

[Claim 2]

This metallic oxide And/

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Field of the Invention]

[0001]

This invention relates to the transparent conductive layered product which has a transparency electric conduction membrane layer on a transparency macromolecule substrate. The hardening resin layer which has irregularity on a transparency giant-molecule substrate, and a transparency electric conduction membrane layer are related with the transparent conductive layered product suitable as an object for transparency touch panels by which the laminating was carried out one by one in more detail.

[Background of the Invention]

[0002]

In recent years, many transparency touch panels which realize an interactive input method as one of the man machine interfaces came to be used. A transparency touch panel has an optical method, an ultrasonic sensing method, a capacitive sensing method, a resistance film method, etc. with a location detection method. Among these, a resistance film method has simple structure, and since a price / engine-performance ratio is also good, it shows spread rapid in recent years.

[0003]

The transparency touch panel of a resistance film method is an electrical part held and constituted by fixed spacing so that a transparency conductive layer may counter two transparent electrode substrates which have a transparency conductive layer. From the transparent electrode substrate (movable electrode substrate) formed in the check-by-looking side, a movable electrode substrate is pressed, and is sagged with a pen or a finger, a movable electrode substrate is contacted to the transparent electrode substrate (fixed electrode substrate) of another side, when a movable electrode substrate and a fixed electrode substrate flow, a detector detects a location and a predetermined input is made. Under the present circumstances, the interference color called the so-called Newton rings may appear, and the visibility of a display is reduced on the outskirts of the pointing section, such as a pen currently pressed or a finger. Moreover, it is also known for the large-sized transparency touch panel exceeding 10 inch size that the Newton ring will be generated by the deflection of the transparent conductive layered product currently used for the movable electrode substrate.

[0004]

Forming a concavo-convex configuration in the field in which the transparency electric conduction membrane layer of a transparent conductive layered product is formed as an approach of controlling the Newton ring in the transparency touch panel of such a resistance film method is known well. For example, the approach of giving on a plastic film is indicated [conductive layer / the specified quantity *** coating layer and / transparency] by the patent reference 1 in the filler whose first [an average of] particle diameter is 1-4 micrometers. Moreover, the approach of forming on a film the projection coating layer from which the second [an average of] particle diameter of a silica is set to 1.0-3.0 micrometers is indicated by the patent reference 2.

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[0005]

however, in the case of the transparency touch panel which adopted the approach of giving the particle whose first [an average of] diameter of an aggregated particle be about several microns as mentioned above in the field of a substrate, while mitigating the Newton ring, when the resin of the particle [which be use] and particle circumference play the role of a lens, the problem on which the pixel of a highly minute display object degrade color separation (CHIRATSUKI) remarkably generate a lifting and the visibility of a display.

[0006]

Moreover, by the patent reference 3, in order to lose staking nature by the patent reference 4 further in order to control the Newton rings in a transparency touch panel, and to improve a stroke life, the surface roughness of a concavo-convex configuration is specified, but in said range, although the effectiveness which controls Newton rings is seen, it is difficult [it] to mitigate a flicker on a high brilliance screen.

[0007]

Moreover, there is a Newton ring prevention layer which used the mat-sized agent of two or more different average particles like the patent reference 5 as the formation approach of the concavo-convex configuration except said. Although it is possible for the Newton ring prevention layer formed by such approach to control a flicker on a highly minute display object, in order to control generating of the Newton ring, the haze of a hardening resin layer is required 5% or more, and it cannot be said that it is suitable as a transparency touch panel.

[0008]

It is indicated by the patent reference 6 to be the compound in which a polymerization is possible or its oligomer, and thermoplastics by irradiating an activation energy line to have used the coating for anti-dazzle film formation characterized by the first [an average of] particle diameter coming to contain a non-substlety particle (0.001 micrometers or more and less than 1 micrometer). Although this is the example which formed the irregularity on the front face of the film, without using several microns particles including a secondary particle etc. substantially so that anti-dazzle property may be made to discover by adopting such a configuration, when it is adapted for a highly minute display object, it does not stop the CHIRATSUKI nature of a pixel.

[0009]

[Patent reference 1] JP.10-323931.A

[Patent reference 2] JP.2002-373056.A

[Patent reference 3] The patent No. 3214575 official report

[Patent reference 4] JP.8-2896.Y

[Patent reference 5] JP.2001-084839.A

[Patent reference 6] JP.2002-275391.A

[Description of the Invention]

[Problem(s) to be Solved by the Invention]

[0010]

This invention aims at offering the transparency touch panel which mitigates a flicker on a highly minute screen further, controlling the interference figure generated between a movable electrode substrate and a fixed electrode substrate.

[Means for Solving the Problem]

[0011]

The result of having examined wholeheartedly the surface roughening technique which used the ultrafine particle in order that this invention persons might solve said technical problem. The particle whose mean particle diameter currently generally used conventionally is several microns, and the system which added the ultrafine particle of nano size to the several microns particle. Or although the ultrafine particle of nano size is used, it differs from the condition of having distributed the particle of micron size substantially like the system using a several microns secondary fog particle, substantially. When the first [an average of] particle diameter consisted of an ultrafine particle 100nm or less and an ultrafine particle made it distribute in a hardening resin layer as less than 1.0-micrometer floc, it succeeded in forming a concavo-convex configuration. And by the transparency touch panel which used the transparent conductive

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layered product by which the ultrafine particle addition and thickness of the hardening resin layer which has the irregularity formed in the surprising thing by said approach were controlled, it came to complete a header and this invention for it being hard to produce the color separation (CHIRATSUKI) of the pixel on a highly minute display object, controlling the Newton rings generated between a movable electrode substrate and a fixed electrode substrate.

[0012]

That is, this invention is as follows.

The laminating of the hardening resin layer -1 and transparency electric conduction membrane layer to which the 1st invention has irregularity at least on one side of a transparency macromolecule substrate is carried out one by one. The hardening resin layer -1 consists of an ultrafine particle A which a hardening resin component and the first [an average of] particle diameter become from a metallic oxide and/or a metal fluoride 100nm or less. (1) As opposed to the hardening resin component 100 weight section an ultrafine particle A More than 5 weight sections Contain at a rate below 50 weight sections, and the ultrafine particle forms less than 1.0-micrometer floc. (2) The thickness of the hardening resin layer -1 concerned is 1 micrometers or more 10 micrometers or less. (3) JIS of the hardening resin layer -1 The ten-point average of roughness height (Rz) defined by B0601 (1994 edition conformity) 100nm or more less than 500nm, (4) JIS when average arithmetic granularity (Ra) carries out the laminating of the 10nm or more hardening resin layer -1 in which it is less than 50nm and has irregularity further on an organic macromolecule substrate The haze defined by B7381 is the transparent conductive layered product characterized by being less than 5% 1% or more.

[0013]

The 2nd invention This metallic oxide And/ The ultrafine particle which consists of a metal fluoride Or Sb2O5, SnO2, SiO2, SnO2 and TiO2, Y2O3, ZnO [In2O3, SnO2, HfO2 and La2O3, MgF2 and Sb2O5.] [aluminum 2O3, Bi2O3, CeO2 and In2O3] And it is the transparent conductive layered product of the 1st invention characterized by the thing which is chosen from the group which consists of ZrO2, and which is a kind at least.

[0014]

the 3rd invention — between the hardening resin layer -1 and transparency electric conduction membrane layers — a refractive index — 1.20-1.55 — in addition — and thickness is the 1st characterized by having the hardening resin layer -2 which is 0.05-0.5 micrometers, and the transparent conductive layered product of the 2nd invention.

[0015]

The 4th invention is the 1st characterized by having the optical interference layer which consists of at least one layer low refractive-index layer and at least one-layer high refractive-index layer, and a low refractive-index layer touching a transparency electric conduction membrane layer between the hardening resin layer -1 and a transparency electric conduction membrane layer, and the transparent conductive layered product of the 2nd invention.

[0016]

The 5th invention is the transparent conductive layered product of the 1st characterized by for a transparency electric conduction membrane layer being the film of the crystalline substance which used indium oxide as the principal component, and the thickness of a transparency electric conduction membrane layer being 5-50nm — the 4th invention.

[0017]

The 6th invention is a transparency touch panel characterized by using the transparent conductive layered product of the 1st — the 5th invention as one [at least] transparent electrode substrate in the transparency touch panel arranged and constituted so that transparency conductive layers with two mutual transparent electrode substrates with which the transparency conductive layer was prepared at least in one side might face each other.

[Effect of the Invention]

[0018]

According to this invention, an ultrafine particle 100nm or less consists [the hardening resin layer which has irregularity / a hardening resin component and primary / an average of / particle diameter] of less than 1.0-micrometer floc. By the transparency touch panel using the

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transparent conductive layered product which consists of a hardening resin layer which has this irregularity Mitigating the Newton ring generated between a movable electrode substrate and a fixed electrode substrate even if adapted for a highly minute display, it has the optical property excellent in the visibility which was not able to be realized in a Prior art of being hard to produce the color separation (CHIRATSUKI) of a pixel — completely — new — it is applicable as a substrate [****] for touch panels.

[Best Mode of Carrying Out the Invention]

[0019]

Hereafter, although the gestalt of operation of this invention is explained, this invention is not limited to the following explanation.

<The hardening resin layer -1 which has irregularity>

The hardening resin layer -1 which has the irregularity used for this invention consists of an ultrafine particle A which a hardening resin component and primary [an average of] particle diameter become from a metallic oxide or a metal fluoride 100nm or less. As this hardenability resinous principle, for example, ionizing-radiation hardening mold resin, heat-curing mold resin, etc. are mentioned.

[0020]

As a monomer which gives ionizing-radiation hardening mold resin, monofunctional [such as polyol acrylate, polyester acrylate, urethane acrylate that gives hard layers other than the above, epoxy acrylate, denaturation styrene acrylate, melamine acrylate, and silicon content acrylate,], and polyfunctional acrylate can be mentioned, for example.

[0021]

As a concrete monomer, for example Trimethylolpropanetrimethacrylate, A TORIMECHIRORU polo pan ethyleneoxide denaturation thoria chestnut rate, A TORIMECHIRORUPORO pan propylene oxide denaturation thoria chestnut rate, An isocyanuric acid ethyleneoxide denaturation thoria chestnut rate, a pentaerythritol thoria chestnut rate, Dipentaerythritol hexaacrylate, dimethylol tricyclodecane diacrylate, Polyfunctional monomer, such as a tripropylene glycol thoria chestnut rate, diethylene glycol diacrylate, 1,6-hexanediol diacrylate, epoxy denaturation acrylate, urethane denaturation acrylate, and epoxy denaturation acrylate, is mentioned. These may be used independently, some kinds may be mixed and used, and optimum dose addition of the hydrolyzate of various alkoxysilane may be carried out depending on the case. In addition, when ionizing radiation performs the polymerization of a resin layer, optimum dose addition of the well-known photopolymerization initiator is carried out. Moreover, optimum dose addition of the photosensitizer may be carried out if needed.

[0022]

As a photopolymerization initiator, an acetophenone, a benzophenone, a benzoin, benzoyl benzoate, and thioxanthone are mentioned, and triethylamine, tri-n-butyl phosphine, etc. are mentioned as a photosensitizer.

[0023]

The melamine system heat-curing mold resin which made the monomer heat-curing mold resin, a etherification methylol melamine, etc. of the organosilane system which made silane compounds, such as methyl triethoxysilane and phenyltriethoxysilane, the monomer as heat-curing mold resin, for example, isocyanate system heat-curing mold resin, phenol system heat-curing mold resin, epoxy hardening mold resin, etc. are mentioned. It is also possible in these hardening resin independent or to use two or more sets, doubling. Moreover, it is also possible to mix thermoplastics if needed. In addition, when constructing a bridge in a resin layer with heat, optimum dose combination of a well-known reaction accelerator and the curing agent can be carried out.

[0024]

As a reaction accelerator, triethylenediamine, a dibutyl tin JIRAU rate, benzyl monomethylamine, a pyridine, etc. are mentioned, for example. As a curing agent, the methyl hexahydro phthalic anhydride, 4, and 4'-diamino diphenylmethane, 4, and 4'-diamino -3, 3'-diethyl diphenylmethane, diamino diphenyl sulfone, etc. are mentioned, for example.

[0025]

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Although the first [an average of] particle diameter can use as an ultrafine particle A 100nm or less than there is especially no limit. For example, Sb₂O₃, SnO₂, SiO₂, SnO₂ and TiO₂, Y₂O₃, ZnO, [In₂O₃, SnO₂, HfO₂ and La₂O₃, MgF₂ and Sb₂O₃,] [aluminum 2O₃, Bi₂O₃, CeO₂ and In₂O₃,] What consists of a metallic oxide or metal fluorides, such as ZrO₂, can be mentioned. Two or more kinds of these may be used together. Moreover, a metallic oxide and a metal fluoride can also be used simultaneously.

[0026]

Since the first [an average of] particle diameter of this ultrafine particle A does not cause mizunose according [a hardening resin layer] to an internal haze, the smaller one needs to be desirable and it is necessary to be 100nm or less. 80nm or less of first [an average of] particle diameter of this ultrafine particle A is 60nm or less still more preferably. Moreover, although especially a minimum does not have a limit, it is 5nm. The first [an average of] particle diameter of an ultrafine particle A can be measured using a laser diffraction scattering method particle-size-distribution measuring device. Moreover, actual magnitude can also be measured by using a transmission electron microscope etc. for measuring particle diameter in simple. After carrying out embedding of the hardening resin layer which specifically contains an ultrafine particle with an epoxy resin etc. and stiffening an epoxy resin layer thoroughly, it flake-izes with a microtome and a test portion is produced. Furthermore, this test portion can be observed with a transmission electron microscope, ten or more magnitude of an ultrafine particle can be measured at random, and it can ask for the first [an average of] particle diameter by equalizing such measured value.

[0027]

Moreover, as a content of the ultrafine particle A currently distributed in the hardening resin layer -1, ultrafine particles A are below 50 weight sections more than 5 weight sections to the hardening resin component 100 weight section, it is below 40 weight sections more than the 7.5 weight sections preferably, and they are below 30 weight sections more than 10 weight sections still more preferably. It is difficult to form a concavo-convex configuration in the case where an ultrafine particle A component is made under 5 weight sections, and when exceeding 50 weight sections, although it is possible, a haze becomes large, and it is not appropriate for the application as a Newton ring prevention layer of a transparency touch panel to form a concavo-convex configuration.

[0028]

In this invention, the ultrafine particle A mainly forms less than 1.0-micrometer floc in the hardening resin layer -1. The magnitude of the floc of an ultrafine particle is observable under a transparency mold microscope said written approach. Suppose that the floc said by this invention points out the lump which does not have binders, such as hardening resin, real ***** between an ultrafine particle and a ***** ultrafine particle.

[0029]

Although the magnitude of the floc of an ultrafine particle A is able to form the hardening resin layer which has at least 1.0 micrometers or more of irregularity, since thixotropy is easily discovered to an ultrafine particle A and workability falls to it, it is not suitable. Furthermore, although it is possible to make the prevention effectiveness of the Newton ring discover like the patent reference 2 of said publication when floc forms a secondary particle 1.0 micrometers or more, it is difficult to control a flicker on a highly minute display object. Moreover, when an ultrafine particle A does not form floc but is carrying out homogeneity distribution into the hardening resin layer, a hardening resin layer cannot form only the irregularity which makes the Newton ring prevention effectiveness discover.

[0030]

The thickness of the hardening resin layer -1 which has irregularity is 1 micrometers or more 10 micrometers or less, and is 2 micrometers or more 5 micrometers or less still more preferably 1.5 micrometers or more 7 micrometers or less preferably. When thickness is less than 1 micrometer, since formation of a concavo-convex configuration becomes difficult, it is not suitable. Moreover, although there is no big problem on a property, since processing becomes difficult in the case where thickness exceeds 10 micrometers, it is not suitable.

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hardening resin layer is formed in order to control the manifestation of the dispersibility of an ultrafine particle, and thixotropy, it is possible to choose suitably, to add and to use a solvent and a dispersant. As a solvent, various kinds, such as for example, an alcoholic system, an aromatic series system, a ketone system, a lactate system, the Cellosolve system, and a glycol system, can be used. As a dispersant, various kinds, such as for example, a fatty-acid amine system, a sulfonic-acid amide system, epsilon-caprolactone system, a hydro stearin acid system, a polycarboxylic acid system, and a polyester amine, can be used. These solvents and dispersants can be used combining respectively independent or two sorts or more.

[0039]

Although the reason it makes cylindrical floc with a die length of less than 1.0 micrometers form, and forms irregularity in a hardening resin layer front face, without forming a secondary particle 1.0 micrometers or more like the patent reference 5 although the hardening resin layer in this invention consists only of a hardening resin component and an ultrafine particle is not certain, the surface tension which an ultrafine particle probably has is considered to move the front face of a hardening resin layer. Especially this phenomenon is in the inclination seen when an ultrafine particle forms cylindrical floc with a die length of less than 1.0 micrometers and has still more suitable thixotropy, and can form the field where front-face nature completely differed by choosing a solvent, a leveling agent, and hardenability resin suitably.

[0040]

<Transparency macromolecule substrate>

What used as the film the thermoplastic or thermosetting organic high molecular compound which is excellent in transparency can be used for the transparency macromolecule substrate used for this invention. It will not limit, especially if it is the transparent organic macromolecule excellent in thermal resistance as this organic high molecular compound. For example, polyester system resin, such as polyethylene terephthalate, polyethylene -2, 6-naphthalate, and the poly diallyl phthalate, polycarbonate resin, polyether aze phone resin, Pori Sall John resin, polyarylate resin, acrylic resin, cellulose acetate resin, amorphous polyolefine, etc. are mentioned. Of course, these can be used also as independent or a blend as a homopolymer and a copolymer. Although a these transparency organic macromolecule substrate is suitably fabricated by the general melting extrusion method or the solution casting method, carrying out uniaxial stretching or a NI shaft drawing to the transparency organic high polymer film fabricated if needed, raising a mechanical strength or raising an optical function is also performed preferably.

[0041]

When using the transparency electric conduction layered product of this invention as a movable electrode substrate of a transparency touch panel, the thickness as a substrate configuration from the point of the reinforcement for maintaining the flexibility for operating a transparency touch panel as a switch and surface smoothness has the desirable thing of the shape of a 75-400-micrometer film. When using as a fixed electrode substrate, although the thing of the shape of a sheet with a thickness [the point of the reinforcement for maintaining surface smoothness to] of 0.4-4.0mm is desirable, other sheets and thickness of lamination and the whole may be made a configuration which is set to 0.4-4.0mm, and the thing of the shape of a film with a thickness of 50-400 micrometers may be used. Or it is also possible to use the thing of the shape of a film with a thickness of 50-400 micrometers with the configuration stuck on the display front face.

[0042]

When the transparency electric conduction layered product of this invention is used as a movable electrode substrate of a transparency touch panel, the thing in which the transparency conductive layer was formed on said organic high polymer film substrate, glass substrates, or these layered product substrates may be used for a fixed electrode substrate. The thickness of the fixed electrode substrate which consists of reinforcement of a transparency touch panel and a point of weight from a monolayer or a layered product has 0.4-4.0 desirablemm.

[0043]

Moreover, recently, the polarizing plate or the transparency touch panel of a configuration of having carried out the laminating of the (polarizing plate + phase contrast film) new type has

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[0031]

Since the irregularity of a required configuration is formed also by controlling thickness, the concavo-convex front face in this invention is dramatically important for controlling thickness. When the ultrafine particle component to contain changes only thickness as a fixed amount to a hardening resin component especially in the case of this invention, it is tended for thickness to be made thin, namely, for thickness to be thickened by tending to carry out flattening of the front face at reverse, so that 1 micrometer is approached, that is, to carry out surface roughening of the front face to a surprising thing, so that 10 micrometers is approached.

[0032]

The hardening resin layer -1 which has irregularity is JIS. The ten-point average of roughness height (Rz) defined by B0601 (1994 edition conformity) is 100nm or more less than 500nm, is 100nm or more less than 400nm preferably, and is 100nm or more 300nm or less still more preferably. If a haze becomes large and is adapted for a highly minute display object when the Newton ring may arise easily between the movable electrode substrate of a transparency touch panel and a fixed electrode substrate when the ten-point average of roughness height is less than [(Rz)100nm], and the ten-point average of roughness height becomes more than (Rz) 500nm, it is not desirable from the reasons of the color separation of a pixel arising and starting CHIRATSUKI.

[0033]

Moreover, the hardening resin layer -1 which has irregularity is JIS. The average arithmetic granularity (Ra) defined by B0601 (1994 edition conformity) is 10nm or more less than 50nm, is 10nm or more 40nm or less preferably, and is 10nm or more 35nm still more preferably. When average arithmetic granularity (Ra) is less than 10nm, the Newton ring may arise easily between the movable electrode substrate of a transparency touch panel and a fixed electrode substrate. On the other hand, if a haze becomes large and is adapted for a highly minute display object when the ten-point average of roughness height becomes more than (Rz)500nm, it is not desirable from the reasons of the color separation of a pixel arising and starting CHIRATSUKI.

[0034]

JIS when carrying out the laminating of the hardening resin layer -1 which has irregularity on an organic macromolecule substrate. The haze defined by B7361 is less than 5% more than per %, is less than 4% more than per % preferably, and is less than 3.5% 1.5% or more still more preferably. When a haze is less than 1%, if it is the range where the color separation of a pixel arises on a highly minute display object, and CHIRATSUKI does not occur even if the Newton ring may arise in the movable electrode substrate and fixed electrode substrate of a transparency touch panel at preparation and a haze is 5% or more, there will be no property top problem, but since the haze of a transparency touch panel becomes large, it is not desirable.

[0035]

Especially as the formation approach of a hardening resin layer of having the irregularity in this invention, formation by the wet method is suitable. A doctor knife, a bar coating machine, a gravure roll coater, a curtain coating machine, a knife coating machine, a spin coater, etc. can use all well-known approaches, such as a spray method and dip coating, in that case.

[0036]

The ultrafine particle of the specified quantity distributed in dispersion liquid may specifically be added to hardenable resin, a reaction initiator may be added further, a solvent may be further added if needed for dilution etc., and it mixes. Subsequently, use this solution constituent for the front face of a transparency macromolecule substrate, apply the above-mentioned approach, irradiate heat and light, resin is made to react, and a hardening resin layer is made to form.

[0037]

The hardening resin layer which has the irregularity of this invention can control a haze freely to Rz, Ra, and a pan by changing parameters, such as a solvent, a dispersant, an addition of an ultrafine particle, and thickness of a hardening resin layer.

[0038]

Moreover, it depends for the irregularity of the front face of the hardening resin layer in this invention also on the dispersibility of an ultrafine particle and thixotropy to be used. So, in case a

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been developed in the field of the input side (user side) of a transparency touch panel. It is in the advantage of this configuration raising the contrast of the display in the condition of having reduced the reflection factor of the outpatient department light in the interior of a transparency touch panel below in one half, and having installed the transparency touch panel mainly according to an optical operation of said polarizing plate or a (polarizing plate + phase contrast film).

[0044]

By such transparency touch panel of a type, from polarization passing a transparency electric conduction layered product. It is desirable to use what has the property which was excellent in the optical isotropy as a transparency organic high polymer film. The refractive index of nx and phase leading shaft orientations for the refractive index of the direction of a lagging axis of a substrate specifically ny. When thickness of a substrate is set to d (nm), it is desirable that the retardation value Re within a field expressed with Re=(nx-ny) x d (nm) is at least 30nm or less, and it is more desirable that it is 20nm or less. In addition, the retardation value within a field of a substrate is represented with a value with a wavelength of 590nm measured using the rate measuring device of a multi-wavelength birefringence (Jasco Corp. make M-150) here.

[0045]

Thus, in the application of the transparency touch panel of the type with which polarization passes the illustrated transparent conductive layered product, although the retardation value within a field of a transparent electrode substrate is dramatically important. In addition, it is desirable that K value expressed with K=(nx+ny)/2-nz x d when the refractive index of the three-dimensions refractive-index property of thickness of a transparent electrode substrate, i.e., the direction of a substrate, is set to nz is -250-150nm. - It is more desirable when that it is in the range of 200-100nm acquires the angle-of-visibility property which was excellent in the transparency touch panel.

[0046]

The shaping substrate which fabricated ultraviolet curing mold resin, such as a shaping substrate of heat-curing mold resin, such as a molding substrate and epoxy system resin, which fabricated a polycarbonate, amorphous polyarylate, polyether sulfone, polysulfone, triacetyl cellulose, diacetyl cellulose, amorphous polyolefines and these denaturation objects, or a copolymerization object with an another kind ingredient in the shape of a film, and acrylic resin, a film and in the shape of a sheet, for example as a transparency organic giant-molecule substrate in which the property excellent in these optical isotropy is shown is illustrated. Molding substrates, such as a polycarbonate, amorphous polyarylate, polyether sulfone, polysulfone, amorphous polyolefines and these denaturation objects, or a copolymerization object with an another kind ingredient, are most preferably mentioned from viewpoints, such as a moldability, and a manufacturing cost, thermal stability.

[0047]

As a polycarbonate, more specifically For example, bisphenol A, 1 and 1-JI (4-phenol) cyclohexyldiene, 3 and 3, 5-trimethyl -1 and 1-JI (4-phenol) cyclohexyldiene. They are the polymer which makes a monomeric unit at least one component chosen from the group which consists of a fluorene -9, 9-JI (4-phenol), a fluorene -9, 9-JI (3-methyl-4-phenol), etc., copolymers, or such mixture. The molding substrate of the polycarbonate (as goods, made in Teijin Chemicals, Inc. "a panlight" and "Apec HT" by Bayer etc. are illustrated, for example) of about 15000 to 100000 range is preferably used for a mean molecular weight.

[0048]

Moreover, as amorphous polyarylate, molding substrates, such as "ISARIRU" by the "U polymer" iso nova company etc., are illustrated as goods. [by "Elmec" Unitika, Ltd.] [by Kaneka Corp.]

[0049]

As amorphous polyolefine, molding substrates, such as "ZEONOA" by Nippon Zeon Co., Ltd. and a product "ATON" made from JSR, Inc., are illustrated as goods.

[0050]

As the manufacture approach of the shaping substrate using these high molecular compounds, although approaches, such as a melting extrusion method, and the solution casting method, an

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injection molding method, are illustrated, it is desirable to fabricate especially from a viewpoint which acquires the outstanding optical isotropy using the solution casting method.

[0051]

<Transparency electric conduction membrane layer>

In this invention, the transparency electric conduction film is prepared in contact with the hardening resin layer -1 top which has irregularity or the hardening resin layer -2, or an optical interference layer. By preparing the transparency electric conduction film in contact with the above-mentioned hardening resin layer -2, mechanical characteristics, such as the writing endurance of a transparent conductive layered product, improve. There is a tin oxide film which doped the ITO film, antimony or a fluorine etc. which contains tin oxide two to 20% of the weight as a transparency conductive layer here. As the formation approach of a transparency conductive layer, although there are PVD, such as the sputtering method, vacuum evaporation technique, and the ion plating method, or a coating method, print processes, and a CVD method, PVD or a CVD method is desirable. In the case of PVD or a CVD method, from the point of transparency and conductivity, 5-50nm is desirable still more desirable, and the thickness of a transparency conductive layer is 10-30nm. Since the permeability of a transparent conductive layered product will fall if there is an inclination for the thickness of a transparency electric conduction membrane layer to be inferior to the stability of resistance with the passage of time by less than 10nm and it exceeds 30nm, it is not desirable. It is desirable that a surface-electrical-resistance value uses 100-2000ohm/□, and the transparency electric conduction membrane layer that shows the range of 140-2000ohm/□ is more preferably in 10-30nm of thickness from reduction of the power consumption of a transparency touch panel, the need on circuit processing, etc. Furthermore, the film which mainly consists of an indium oxide of a crystalline substance (substantially 100%) as a transparency conductive layer is more desirable. The layer 3000nm or less which mainly consists of an indium oxide of a crystalline substance is preferably used especially for the diameter of crystal grain. Since writing endurance will worsen if the diameter of crystal grain exceeds 3000nm, it is not desirable. The greatest thing in the diagonal line in each field of the shape of a polygon observed under a transmission electron microscope (TEM) and an ellipse or a diameter is defined as the diameter of crystal grain here.

[0052]

<Hardening resin layer -2>

In this invention, grant may be formed between the hardening resin layers -1 and transparency electric conduction membrane layers which have irregularity, and in order to improve more, the hardening resin layer -2 may be formed for optical properties, such as total light transmission. As a hardening resin layer -2 used for this invention, ionizing-radiation hardening mold resin, heat-curing mold resin, etc. are mentioned, for example.

[0053]

As ionizing-radiation hardenability resin, there are monofunctional [such as polyol acrylate, polyester acrylate, urethane acrylate, epoxy acrylate, denaturation styrene acrylate, melamine acrylate and silicon content acrylate,], polyfunctional acrylate system ionization radioactivity line hardening mold resin, etc., for example.

[0054]

As heat-curing mold resin, melamine system heat-curing mold resin, such as heat-curing mold resin (alkoxysilane) of organosilane systems, such as methyl triethoxysilane and phenyltriethoxysilane, and a etherification methyl melamine, isocyanate system heat-curing mold resin, phenol system heat-curing mold resin, epoxy hardening mold resin, etc. are mentioned. It is also possible in these hardening resin independent or to use two or more sets, doubling. Moreover, it is also possible to mix thermoplastics if needed. In addition, when constructing a bridge in a resin layer with heat, optimum dose addition of a well-known reaction accelerator and the curing agent is carried out. As a reaction accelerator, triethylenediamine, a dibutyl tin JIRAU rate, benzyl monomethylamine, a pyridine, etc. are mentioned, for example. As a curing agent, the methyl hexahydro phthalic anhydride, 4, and 4'-diamino diphenylmethane, 4 and 4'-diamino -3,3'-diethyl diphenylmethane, diamino diphenyl sulfone, etc. are mentioned, for

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[0063]

the content of this ultrafine particle B — the heat-curing mold resin or/and ionizing-radiation hardening mold resin 100 weight section — receiving — the 10 - 400 weight section — desirable — the 30 - 400 weight section — it is the 50 - 300 weight section still more preferably. The content of an ultrafine particle B may become inadequate [the 400 weight sections / film reinforcement or adhesion], and, on the other hand, a refractive index predetermined in the content of an ultrafine particle B may not no longer be obtained below in 10 weight sections.

[0064]

When making the hardening resin layer -2 or the optical interference layer mentioned later contain this ultrafine particle B, unlike the case where it adds in the hardening resin layer -1, the ultrafine particle B is distributing in the hardening resin layer -2 or the optical interference layer at homogeneity, and what has neither flocc nor thixotropy is used.

[0065]

As fluororesin, for example Vinylidene fluoride, hexafluoropropylene, Tetrafluoroethylene, fluoro ethylene, trifluoro ethylene, Chlorotrifluoroethylene, 1,2-dichloro-1,2-difluoro ethylene, 2-BUROMO - 3,3, and 3-trifluoro ethylene, 3-BUROMO - 3, a 3-difluoro propylene, 3,3, and 3-trifluoro propylene, 1 and 1,2-TORIKURORO - The thing containing 5 - 70 % of the weight is illustrated in the monomer component which has fluorine atoms, such as 3,3, and 3-trifluoro propylene and alpha-trifluoro methacrylic acid.

[0066]

the content of fluororesin — the heat-curing mold resin or/and ionizing-radiation hardening mold resin 100 weight section — receiving — the 50 - 300 weight section — desirable — the 100 - 300 weight section — it is the 150 - 250 weight section still more preferably. When the content of fluororesin becomes inadequate [film reinforcement or adhesion] above the 300 weight sections, on the other hand, a **** and a refractive index predetermined in the content of fluororesin may not no longer be obtained below in 50 weight sections.

[0067]

<Optical interference layer>

In this invention, in order to control a refractive index and to raise transparency between the hardening resin layers -1 and transparency electric conduction membrane layers which have irregularity, an optical interference layer can be prepared.

The optical interference layer used by this invention consists of much more high refractive-index layer and low refractive-index layer much more at least at least. The combination unit of a high refractive-index layer and a low refractive-index layer can also be set or more to two. When an optical interference layer consists of much more high refractive-index layer and much more low refractive-index layer, 30nm - 300nm is desirable still more desirable, and the thickness of an optical interference layer is 50nm - 200nm. The high refractive-index layer which constitutes the optical interference layer of this invention is a layer formed from the ultrafine particle which a metal alkoxide independent or at least one or more kinds of metal alkoxides, and at least one or more kinds of primary particle diameter become from a metallic oxide or a metal fluoride 100nm or less.

[0068]

Alkoxysilane, a titanium alkoxide, and zirconium alkoxide can be mentioned as a metal alkoxide used for this invention.

As alkoxysilane, it is the same thing mentioned in the hardening resin layer -2.

As a titanium alkoxide, titanium tetra-isopropoxide, tetra-n-propyl altitanate, titanium tetra-n-butoxide, tetrakis (2-ethoxyethoxy) titanate, etc. are illustrated, for example.

As zirconium alkoxide, zirconium tetra-isopropoxide, zirconium tetra-n-butoxide, etc. are illustrated, for example.

[0069]

in this high refractive-index layer, the primary [an average of] particle diameter which consists of the metallic oxide or metal fluoride of said publication is independent in the ultrafine particle B 100nm or less — or two or more kind suitable amount addition can be carried out. It is possible by adding this ultrafine particle B to adjust the refractive index of this high refractive-index

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example.

[0055]

The above-mentioned alkoxysilane forms a hardening resin layer by hydrolyzing and carrying out a condensation polymerization and becoming about this. As this alkoxysilane, a tetramethoxy silane, a tetra-ethoxy silane, methyl trimethoxysilane, methyl triethoxysilane, dimethylmethoxysilane, gamma-glycidopropyltrimethoxysilane, beta-(3,4-epoxycyclohexyl) ethyltrimethoxysilane, vinyltrimethoxysilane, N-beta (aminoethyl) gamma-aminopropyl trimethoxysilane, N-beta(aminoethyl) gamma-aminopropyl dimethoxysilane, gamma-aminopropyl triethoxysilane, etc. are illustrated, for example.

[0056]

As for these alkoxysilane, it is desirable to mix and use two or more kinds from viewpoints, such as a mechanical strength of a layer, and adhesion, solvent resistance, and it is desirable that the alkoxysilane which is the range of 0.5 - 40% of weight ratios, and has an amino group during the total presentation of alkoxysilane from a viewpoint of solvent resistance especially at intramolecular contains.

[0057]

Although alkoxysilane performs hydrolysis and dehydration condensation beforehand, oligomerizes them moderately and may be used even if it uses it by the monomer, it carries out coating of the coating liquid which dissolved in the suitable organic solvent and was usually diluted on a substrate. Hydrolysis advances with the moisture in air etc., then, as for the paint film formed on the substrate, bridge formation advances by dehydration condensation.

[0058]

Generally, suitable heat-treatment is required for acceleration of bridge formation, and it is desirable to heat-treat more than for several minutes at the temperature of 100 degrees C or more in a coating process. Moreover, in parallel to said heat treatment, a degree of cross linking can be raised more by irradiating activity beams of light, such as ultraviolet rays, at a paint film depending on the case.

[0059]

As a dilution solvent, the solvent of an alcoholic system and a hydrocarbon system, for example, ethanol, isopropyl alcohol, a butanol, 1-methoxy-2-propanol, a hexane, a cyclohexane, a ligroin, etc. are desirable. In addition, polar solvents, such as a xylene, toluene, a cyclohexanone, methyl isobutyl ketone, and isobutyl acetate, are also usable. These things can be used as independent or two or more kinds of partially aromatic solvents.

[0060]

As the formation approach of the hardening resin layer -2, the same approach as said hardening resin layer -1 can be used.

In order to adjust the refractive index of the hardening resin layer -2, it is independent, or the ultrafine particle B which primary [an average of] particle diameter becomes from a metallic oxide or a metal fluoride 100nm or less, or two or more sets of fluororesin may be doubled, and may be blended. The refractive index of the hardening resin layer -2 is smaller than the refractive index of the hardening resin layer -1, and it is 1.20-1.45 that refractive indexes are 1.20-1.55 desirable still more preferably. It is desirable still more desirable that it is 0.05-0.5 micrometers, and the thickness of the hardening resin layer -2 is 0.05-0.3 micrometers.

[0061]

100nm or less is desirable still more desirable, and the primary [an average of] particle diameter of this ultrafine particle B is 50nm or less. A good optical interference layer can be formed by controlling the primary particle diameter of this ultrafine particle B to 100nm or less, without a paint film milking.

[0062]

As this ultrafine particle B, for example Sb2O5, SnO2, SiO2, SnO2 and TiO2, Y2O3, ZnO, [In2O3, SnO2, HfO2 and La2O3, MgF2 and Sb2O5] [Bi2O3, CeO2 and In2O3.] The ultrafine particle of metallic oxides, such as ZrO2, or a metal fluoride is illustrated, and the refractive index of MgF2 and SiO2 grade is the ultrafine particle of 1.55 or less metallic oxide or a metal fluoride preferably.

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layer.

[0070]

When adding this ultrafine particle B in this high refractive-index layer, it is desirable still more desirable that it is 0:100-80:20, and the weight ratios of an ultrafine particle B and a metal alkoxide are 0:100-60:40. When the weight ratio of an ultrafine particle C and a metal alkoxide exceeds 80:20, reinforcement and adhesion required for an optical interference layer have lack *****, and are not desirable.

[0071]

As thickness of this high refractive-index layer, 15-250nm is 30-150nm more preferably. Moreover, the refractive index of this high refractive-index layer is larger than the refractive index of the low refractive-index layer mentioned later, and it is desirable that the difference is 0.2 or more.

[0072]

The same thing as said hardening resin layer -2 can be used for the low refractive-index layer which constitutes the optical interference layer of this invention. As thickness of this low refractive-index layer, 15-250nm is 30-150nm more preferably.

[0073]

<Rebound ace court layer>

When the transparent conductive layered product of this invention is used as a movable electrode substrate and it uses for a transparency touch panel, as for the field where external force is added, i.e., a transparency electric conduction membrane layer, it is desirable to prepare a rebound ace court layer in the transparency organic macromolecule substrate side of an opposite hand. As an ingredient for forming a rebound ace court layer, there is polyfunctional acrylate system ultraviolet curing mold resin, such as melamine system heat-curing mold resin, such as heat-curing mold resin of organosilane systems, such as methyl triethoxysilane and phenyltriethoxysilane, and a etherification methylol melamine, polyol acrylate, polyester acrylate, urethane acrylate, and epoxy acrylate, etc., and what mixed SiO2, the ultrafine particle of MgF2 grade, etc. can be used if needed. The ultrafine particle is distributed to homogeneity in a rebound ace court layer in that case. Moreover, the thickness of a rebound ace court layer has desirable 2-5 micrometers from flexibility and an abrasion-resistance point.

[0074]

A rebound ace court layer can be formed by the coating method. As a actual coating method, the aforementioned compound is dissolved in various organic solvents, and a layer is stiffened by radiation irradiation, heat-treatment, etc. after coating on a transparency organic high polymer film using the coating liquid which adjusted concentration and viscosity. As a coating method, the various coating approaches, such as for example, the microphone log RABITA coat method, the MATYA bar coat method, the direct GURABIYA coat method, the reverse roll coat method, the curtain coat method, a spray coating method, a comma coating method, the die coat method, the knife coat method, and a spin coat method, are used.

[0075]

In addition, the laminating of the rebound ace court layer is carried out through a support layer direct or suitable on a transparency organic macromolecule substrate. As such a support layer, for example, the layer which has the function which raises the adhesion of this rebound ace court layer and a transparency organic macromolecule substrate. Various kinds of phase compensation layers, such as a layer which has the three-dimensions refractive-index property that K value turns into a negative value. The layer which has the function which absorbs the function or moisture which prevents transparency of moisture or air, and air, the layer which has the function which absorbs ultraviolet rays and infrared radiation, the layer which has the function to reduce the electrification nature of a substrate are mentioned preferably.

[0076]

A rebound ace court layer can also carry out surface roughening if needed. The particle at least one or more kinds of whose primary [an average of] particle diameter is 0.001 micrometers - 5.0 micrometers is made to contain in a rebound ace court component as an approach of carrying out surface roughening of the rebound ace court layer. Moreover, primary [an average

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of] particle diameter is possible also for considering as the rebound ace court layer in which the ultrafine particle A 100nm or less formed less than 1.0-micrometer floc and by which surface roughening was carried out in a rebound ace court component like the hardening resin layer -1. [Example]

[0077]

Although an example is given below and this invention is explained still more concretely, this invention is not limited to this example. In addition, among an example, the section and especially % are weight criteria, unless it refuses. Moreover, various kinds of measurement in an example was performed as follows.

[0078]

Surface roughness: Product made from Sloan Sensing-pin level difference meter R measured using DEKTA3.

A Measuring condition is 2000 micrometers of measurement length, and a high-pass filter. Ra and Rz were computed by having been referred to as 20.00 micrometers and having removed the external waviness component of a substrate.

[0079]

Haze: The haze (Haze) value was measured using the hazemeter (MDH 2000) by Nippon Denshoku Co., Ltd.

[0080]

CHIRATSUKI nature assessment: The transparence touch panel was installed on the liquid crystal display of about 123 dpi (10.4 inches of vertical angles, XGA (1024x768 dots)), and the existence of CHIRATSUKI was checked visually.

[0081]

Newton-rings nature assessment: 60 slant to the transparence touch panel was observed from the vertical approach of a transparence touch panel, and viewing observed and estimated the existence of the Newton rings in the field to which the movable electrode substrate and the fixed electrode substrate were contacted.

[0082]

The distributed condition check of an ultrafine particle: Embedding of the macromolecule substrate with a hardening resin layer which has the irregularity of this invention was carried out with the epoxy resin, and after the epoxy resin hardened thoroughly, the flake sample was produced with the microtome. This sample was observed with the transmission electron microscope, and the distributed condition of an ultrafine particle was checked (drawing 1 - drawing 4).

[Example 1]

The 4 organic-functions acrylate M405 (Toagosei make) 100 weight section and IRUGA cure 184 (Ibica) ARONIKKUSU Five weight sections made from SUPESHARUTI KEMIKARUZU were dissolved in isobutyl alcohol, and coating liquid A was produced. SiO₂ ultrafine particle (C.I. Kasei 10-% of the weight isopropyl alcohol dispersion liquid) coating liquid A and whose first [an average of] particle diameter are 30nm was mixed so that it might become 15 weight sections to the hardening resin component 100 weight section, and coating liquid B was produced.

[0084]

The hardening resin layer -1 (a) which irradiates ultraviolet rays and has irregularity in a transparence giant-molecule substrate in one field of polyester film (the Teijin E. I. du Pont de Nemours film company make, OFW-188) after [which twists coating liquid B by the bar coat method so that thickness may be set to 3 micrometers] coating and drying for 1 minute at 80 degrees C was formed. The result which carried out haze measurement at this time is shown in a table 1. Moreover, the distributed condition in the inside of the SiO₂ hardening-resin layer -1 of an ultrafine particle (a) is shown in drawing 1 and drawing 2. Much flocs of the shape of a rod which has die length of about 300nm at the maximum about being observed, and SiO₂ ultrafine particle not forming floc 1.0 micrometers or more substantially, but distributing was checked so that drawing 1 and drawing 2 might show. The part round enclosed in the photograph here is the floc of the ultrafine particle shown with a sign 5. It turns out that floc is less than 1 micrometer

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produced. The surface-electrical-resistance values after about 20nm and film production of the thickness of the formed ITO layer were about 350ohm/□. Heat treatment was performed for the produced movable electrode substrate for 150-degree-C 90 minutes, and the ITO film was crystallized. Ushiro's surface-electrical-resistance values which ITO crystallized were about 280ohm/□.

[0093]

The fixed electrode substrate and the transparence touch panel of **** drawing 5 for movable electrode substrates which were produced like the example -1 were produced. The CHIRATSUKI assessment on the highly minute liquid crystal display of the produced transparence touch panel and a Newton ring assessment result are shown in a table 1.

[0094]

[The example 2 of a comparison]

MgF₂ ultrafine particle (C.I. Kasei 20-% of the weight alcoholic dispersion liquid) the coating liquid A used in the example 1 and whose first [an average of] particle diameter are 20nm was mixed so that it might become 15 weight sections to the hardening resin component 100 weight section, and coating liquid E was produced.

[0095]

The hardening resin layer -1 (c) which irradiates ultraviolet rays and has irregularity in a transparence giant-molecule substrate in one field of polyester film (the Teijin E. I. du Pont de Nemours film company make, OFW-188) after [which twists coating liquid B by the bar coat method so that thickness may be set to 5 micrometers] coating and drying for 1 minute at 80 degrees C was formed. In the front face of the formed hardening resin layer -1 (c), the hardening resin layer with flat irregularity was obtained. Moreover, the distributed condition in the inside of the MgF₂ hardening-resin layer -1 of an ultrafine particle (c) is shown in drawing 3 and drawing 4. MgF₂ ultrafine particle not forming floc substantially, but distributing in hardening resin to homogeneity was checked so that drawing 3 and drawing 4 might show.

[0096]

Next, the hardening resin layer -2 (a) was produced for the alkoxysilane coating liquid C used in the example -1 like the example -1 on said hardening resin layer -1 (b). Furthermore, the ITO layer was formed by the sputtering method like the example -1 on this hardening resin layer -2 (a), and the transparent conductive layered product used as a movable electrode substrate was produced. The surface-electrical-resistance values after about 20nm and film production of the thickness of the formed ITO layer were about 350ohm/□. Heat treatment was performed for the produced movable electrode substrate for 150-degree-C 90 minutes, and the ITO film was crystallized. Ushiro's surface-electrical-resistance values which ITO crystallized were about 280ohm/□.

[0097]

The fixed electrode substrate and the transparence touch panel of **** drawing 5 for movable electrode substrates which were produced like the example -1 were produced. The CHIRATSUKI assessment on the highly minute liquid crystal display of the produced transparence touch panel and a Newton ring assessment result are shown in a table 1.

[0098]

[A table 1]

	実施例 1	比較例 1	比較例 2
Rz (Å)	2350	4360	428
Ra (Å)	264	395	28
H z (%)	2.5	2.3	0.97
ニュートンリング評価	観察されず	観察されず	あり
チラツキ評価	なし (良好)	あり	なし (良好)

in the direction of a major axis.

[0085]

Ultraviolet curing mold polyfunctional acrylate plastic paint was used for the reverse side in which the hardening resin layer -1 (a) was formed, and the rebound ace court layer 1 whose thickness is 4 micrometers was formed.

[0086]

Next, gamma-glycidyloxy propyl trimethoxy run (by Shin-Etsu Chemical Co., Ltd. "KBM403") and methyl trimethoxysilane (by Shin-Etsu Chemical Co., Ltd. "KBM13") were mixed by the mole ratio of 1:1, and said alkoxysilane was hydrolyzed by the well-known approach with the acetic-acid water solution (pH=3.0). In this way, to the hydrolyzate of the obtained alkoxysilane, N-beta (aminomethyl) gamma-aminopropyl methoxysilane (by Shin-Etsu Chemical Co., Ltd. "KBM503") was added at a rate of the weight ratio 20:1 of solid content, it diluted with the mixed solution of isopropyl alcohol and n-butanol further, and alkoxysilane coating liquid C was produced.

[0087]

Coating was performed for alkoxysilane coating liquid C by the bar coat method on said hardening resin layer -1 (a), and the hardening resin layer -2 (a) was produced after baking for [130 degrees-C] 2 minutes. Furthermore, on this hardening resin layer -2 (a), indium oxide and tin oxide used the indium oxide-tin oxide target of 98% of pack density by the presentation of the weight ratio 95:5, and formed the ITO layer by the sputtering method, and the transparent conductive layered product used as a movable electrode substrate was produced. The surface-electrical-resistance values after about 20nm and film production of the thickness of the formed ITO layer were about 350ohm/□. Heat treatment was performed for the produced movable electrode substrate for 150-degree-C 90 minutes, and the ITO film was crystallized. Ushiro's surface-electrical-resistance values which ITO crystallized were about 280ohm/□.

[0088]

On the other hand, after carrying out a SiO₂ DIP coat to both sides of a glass plate with a thickness of 1.1mm, the ITO film with a thickness of 18nm was formed by the sputtering method. Next, the fixed electrode substrate was produced by forming a height [of 7 micrometers] diameter [of 70 micrometers], and pitch 1.5mm dot spacer on the ITO film. The fixed electrode substrate and the transparence touch panel of **** drawing 5 for movable electrode substrates which were produced were produced. The CHIRATSUKI assessment on the highly minute liquid crystal display of the produced transparence touch panel and a Newton ring assessment result are shown in a table 1.

[0089]

[The example 1 of a comparison]

It mixed so that it might become the coating liquid A used in the example -1 with the 0.5 weight section to the hardening resin component 100 weight section temporarily [average] about the silica system particle whose particle diameter is 3.0 micrometers, and coating liquid D was produced.

[0090]

The hardening resin layer -1 (b) which irradiates ultraviolet rays and has irregularity in a transparence giant-molecule substrate in one field of polyester film (the Teijin E. I. du Pont de Nemours film company make, OFW-188) after [which twists coating liquid D by the bar coat method so that thickness may be set to 2.3 micrometers] coating and drying for 1 minute at 80 degrees C was formed. The result which carried out haze measurement at this time is shown in a table 1.

[0091]

The rebound ace court layer 1 whose thickness is 4 micrometers like an example -1 was formed in the reverse side in which the hardening resin layer -1 (b) was formed.

[0092]

Next, the hardening resin layer -2 (a) was produced for the alkoxysilane coating liquid C used in the example -1 like the example -1 on said hardening resin layer -1 (b). Furthermore, the ITO layer was formed by the sputtering method like the example -1 on this hardening resin layer -2 (a), and the transparent conductive layered product used as a movable electrode substrate was

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[Brief Description of the Drawings]

[0099]

[Drawing 1] Drawing 1 is the cross-section photograph which made it as the embedding back with hardening resin, made the flake sample the macromolecule substrate with a hardening resin layer which has the irregularity formed in the example 1 with the microtome, and photoed it with the transmission electron microscope.

[Drawing 2] Drawing 2 is the cross-section photograph which carried out photomicrography of the hardening resin layer which has the irregularity containing the ultrafine particle of drawing 1 further.

[Drawing 3] Drawing 3 is the cross-section photograph which photoed the example 1 of a comparison by the same technique as drawing 1.

[Drawing 4] Drawing 4 is the cross-section photograph which carried out photomicrography of the hardening resin layer of drawing 3 further.

[Drawing 5] Drawing 5 is the mimetic diagram of the touch panel created in the example 1.

[Description of Notations]

[0100]

- 1: Embedding resin
- 2: The hardening resin layer which has the irregularity containing an ultrafine particle
- 3: PET film
- 4: The amplification part of the hardening resin layer which has the irregularity containing an ultrafine particle
- 5: Floc of an ultrafine particle
- 6: Rebound ace court layer
- 7: Transparence macromolecule substrate (polyester film)
- 8: Hardening resin layer -1
- 9: Hardening resin layer -2
- 10: Transparence conductive layer
- 11: Glass substrate

[Translation done.]

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